Technical Notes

Surveillance of HIV Infection (Not AIDS)

This report includes data from case reports from 50 areas (see Table 16 for list of areas) that had laws or regulations requiring confidential reporting by name for adults, adolescents, and children with confirmed HIV infection (not AIDS) in addition to the reporting of persons with AIDS as of December 31, 2006. After the removal of personal identifying information, data from these reports were submitted to CDC. The implementation of HIV reporting has differed from state to state. Before 1991, surveillance of HIV infection (not AIDS) was not standardized, and the reporting of HIV infection (not AIDS) was based primarily on passive surveillance. The information on many of the cases reported before 1991 is not complete. Since then, CDC has assisted states in conducting active surveillance of HIV infection (not AIDS) by the use of standardized report forms and software.

Data on HIV infection (not AIDS) should be interpreted with caution. HIV surveillance reports may not be representative of all persons infected with HIV because not all infected persons have been tested. Many HIV-reporting states offer anonymous HIV testing; the results of anonymous tests are not reported to the confidential name-based HIV registries of state and local health departments. Therefore, reports of confidential test results may not represent all persons who tested positive for HIV infection. Furthermore, many factors, including the extent to which testing is routinely offered to specific groups and the availability of, and access to, medical care and testing services, may influence testing patterns. These data provide a minimum estimate of the number of persons known to be HIV infected in states with confidential HIV reporting.

As of December 31, 2006, 5 areas (Hawaii, Maryland, Massachusetts, Vermont, and the District of Columbia) had implemented a code-based system to conduct case surveillance of HIV infection (not AIDS). Montana had implemented a name-to-code system for conducting HIV infection surveillance (in a name-to-code system, names are collected, and after any necessary public health follow-up, names are converted to codes). Data on cases of HIV infection (not AIDS) from these areas are not included in the HIV data tables. In order to acquire high-quality HIV data, CDC recommended in 2005 that all states and U.S. dependent areas adopt confidential name-based public health disease surveillance systems to report cases of HIV infection [1].

For this report, we classified cases in adults, adolescents, and children aged 18 months and older by using the 2000 revised HIV surveillance case definition, which incorporates positive test results or reports of a detectable quantity of HIV nucleic acid or plasma HIV RNA [2]. For children younger than 18 months, the pediatric HIV reporting criteria reflect diagnostic advances that permit the diagnosis of HIV infection during the first months of life. By the use of HIV nucleic acid detection tests, HIV infection can be detected in nearly all infants aged 1 month and older. The timing of the HIV serologic and HIV nucleic acid detection tests specified in the definitive and presumptive criteria for HIV infection is based on the recommended practices for diagnosing infection in children younger than 18 months and on evaluations of the performance of these tests for children in this age group. Children younger than 18 months who were born to an HIV-infected mother are categorized as having been exposed perinatally to HIV infection if the child does not meet the criteria for HIV infection or the criteria for "not infected with HIV" [2, 3]. Children born before 1994 were considered HIV infected if they met the HIV case definition in the 1987 pediatric classification system for HIV infection [4].

Because states initiated reporting on different dates, the length of time reporting has been in place influences the number of HIV infection cases reported. For example, data presented for a given year may include cases reported during only part of the year. Before implementing statewide HIV reporting, some states collected reports of HIV infection (not AIDS) in selected populations. Therefore, these states have reports that precede the initiation of statewide confidential reporting. A state with confidential HIV infection reporting also may report persons who tested positive in that state but who were residents of other states. Therefore, when HIV data are presented by state of residence, cases reported before a state initiated

reporting may have been reported from a state that did have confidential HIV infection reporting.

Over time, HIV infection may progress to AIDS and be reported to surveillance. Persons with HIV infection (not AIDS) who are later reported as having AIDS are deleted from the HIV infection (not AIDS) tables and added to the AIDS tables. Persons with HIV infection may be tested at any point on the clinical spectrum of disease; therefore, the time between diagnosis of HIV infection and diagnosis of AIDS differs. In addition, because surveillance practices differ, the reporting and updating of persons' clinical and vital status differ among states. The completeness of reporting of HIV infection (not AIDS) is estimated at more than 80% [5].

SURVEILLANCE OF AIDS

All 50 states, the District of Columbia, and U.S. dependent areas report AIDS cases to CDC by using a uniform surveillance case definition and case report form. The original definition was modified in 1985 and 1987 [6, 7]. The case definition for adults and adolescents was modified again in 1993 [8; see also 9]. The revisions incorporated a broader range of AIDS-indicator diseases and conditions and used HIV diagnostic tests to improve the sensitivity and specificity of the definition. The laboratory and diagnostic criteria for the 1987 pediatric case definition [4] were updated in 1994 [10]. Effective January 1, 2000, the surveillance case definition for HIV infection was revised to incorporate new laboratory tests. The definition incorporates the reporting criteria for HIV infection and AIDS into a single case definition for adults and children [2].

For persons with laboratory-confirmed HIV infection, the 1987 revision incorporated encephalopathy, wasting syndrome, and other indicator diseases that are diagnosed presumptively (i.e., without confirmatory laboratory evidence of opportunistic infection). In addition to the 23 clinical conditions in the 1987 definition, the 1993 case definition for adults and adolescents includes HIV infection among persons with CD4+ T-lymphocyte counts of fewer than 200 cells/μL or a CD4+ percentage of less than 14 and a diagnosis of pulmonary tuberculosis, recurrent pneumonia, or invasive cervical cancer. For adults, adolescents, and children aged 18 months and older, the 2000 revised HIV surveillance case definition incorporates positive test results or reports of a detectable quantity of HIV nucleic acid or plasma HIV RNA.

The pediatric case definition incorporates the revised 1994 pediatric classification system for evidence of HIV infection. Cases in children who tested positive by Western blot or HIV detection tests before October 1994 were categorized according to the 1987 classification system. For children of any age (birth to 13 years) with an AIDS-defining condition that requires evidence of HIV infection, a single positive HIV virologic test result (i.e., HIV nucleic acid [DNA or RNA], HIV viral culture, HIV p24 antigen) is sufficient for a reportable AIDS diagnosis if the diagnosis is documented by a physician.

Although the completeness of reporting of AIDS cases to state and local health departments differs by geographic region and patient population, studies conducted by state and local health departments indicate that the reporting of AIDS cases in most areas of the United States is more than 85% complete (CDC, unpublished data, 2005) [5, 11–12]. In addition, multiple routes of exposure, opportunistic infections diagnosed after the initial AIDS case report was submitted to CDC, and vital status may not be determined or reported for all cases. However, for persons reported as having AIDS, the reporting of deaths is estimated to be more than 90% complete [13].

Since January 1, 1994, CDC has not accepted AIDS case reports that meet only the laboratory-based immunologic criteria of the 1993 expanded surveillance case definition [8] if information on sex or race/ethnicity is missing. A small number of cases previously reported to CDC without those variables have been returned to the health departments for follow-up and have been deleted from the totals.

TABULATION AND PRESENTATION OF DATA

Data in this report are provisional. This report includes information received by CDC through June 30, 2007. This report is organized in 5 sections. In Sections 1–3 (i.e., Tables 1–12, Figure 1, and Maps 1 and 2), data have been statistically adjusted to correct for delays in the reporting of cases and deaths; when transmission categories are presented, unreported risk factors have been statistically redistributed to better present the trends in the epidemic and the distribution of risk characteristics among affected populations. To assess trends in cases, deaths, or prevalence, it is preferable to use adjusted data, presented by year of diagnosis instead of year of report. Section 4, which presents survival data, is discussed later in the

Technical Notes. In Section 5 (Tables 14–23), HIV and AIDS data are tabulated by date of report to CDC. Data for the U.S. dependent areas are included in the table totals unless their exclusion is specified in a footnote. The U.S. dependent areas are American Samoa, Guam, the Northern Mariana Islands, Puerto Rico, and the U.S. Virgin Islands.

Selection of Areas with Mature HIV Reporting Systems for Analysis of Cases of HIV/AIDS and HIV Infection (Not AIDS)

The inclusion of areas with mature (i.e., since at least 2003) confidential name-based HIV reporting for tabulation and presentation of HIV/AIDS and HIV infection (not AIDS) data was based on the date of the implementation of HIV reporting in the area. Areas must have 4 full calendar years of reporting so that CDC can calculate reporting delays with reasonable precision. Adjustment of case counts for reporting delay is required to reliably display trends in the data [14, 15]. For this report, 38 areas (33 states and 5 U.S. dependent areas) with laws or regulations requiring confidential name-based HIV infection reporting since at least 2003 were eligible for inclusion. The 38 areas are Alabama, Alaska, Arizona, Arkansas, Colorado, Florida, Idaho, Indiana, Iowa, Kansas, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Nebraska, Nevada, New Jersey, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, South Carolina, South Dakota, Tennessee, Texas, Utah, Virginia, West Virginia, Wisconsin, Wyoming, American Samoa, Guam, the Northern Mariana Islands, Puerto Rico, and the U.S. Virgin Islands. For Tables 1, 2, 8, 9, and 12, we used data from these 38 areas to describe diagnoses of HIV/AIDS. For Maps 1 and 2, we also used data from these 38 areas to estimate the numbers of cases of HIV infection (not AIDS).

Selection of Areas for Analyses of Reports of HIV Infection (Not AIDS)

Areas included in tabulations of reports of HIV infection (not AIDS) are based on the date of implementation of name-based HIV infection reporting as of December 31, 2006. For Tables 16, 18, 20, and 22, we used data from 50 areas (45 states and 5 U.S. dependent areas) to describe reports of cases of HIV infection (not AIDS).

Age Groups

For Tables 8–12 and Maps 1 and 2, age groups of persons living with HIV/AIDS, HIV infection (not AIDS), or AIDS are based on the person's age as of December 31, 2006. For Table 7, age groups of persons who died with AIDS are based on the person's age at the time of death. For all other tables, age groups are based on the person's age at the first documented positive HIV-antibody test result for persons with a diagnosis of HIV infection (not AIDS) and on age at diagnosis of AIDS for persons with a diagnosis of AIDS. The age category for adults and adolescents comprises persons aged 13 years and older; the age category for children comprises children younger than 13 years.

Race and Ethnicity

In the *Federal Register* for October 30, 1997 [16], the Office of Management and Budget (OMB) announced the Revisions to the Standards for the Classification of Federal Data on Race and Ethnicity. At a minimum, data on the following race categories should be collected:

- American Indian or Alaska Native
- Asian
- black or African American
- Native Hawaiian or Other Pacific Islander
- white

Additionally, systems must be able to retain information when multiple racial categories are reported. Two ethnicity categories should be collected regardless of race:

- Hispanic
- not Hispanic

Because data for this document were compiled from reports to CDC through June 2007, race and ethnicity information were collected under 2 systems. The race and ethnicity categories in the system used through December 2002 are maintained in this document because most case reports were submitted under that system. Persons who reported multiple racial categories or whose race was unknown are included in the total numbers in Tables 1–5, 7–11, 13, and 19–23. Also, the number of persons reported as "not Hispanic" may include persons whose ethnicity was not reported.

Tabulation of Cases of HIV/AIDS and AIDS

In this report, the term *HIV/AIDS* is used to refer to 3 categories of diagnoses collectively: (1) a diagnosis of HIV infection (not AIDS), (2) a diagnosis of HIV infection with a later diagnosis of AIDS, and (3) concurrent diagnoses of HIV infection and AIDS. For analyses of HIV/AIDS data, we used data from 38 areas (i.e., 33 states and 5 U.S. dependent areas) that have had HIV infection reporting for a sufficient length of time (i.e., since at least 2003) to allow for stabilization of data collection and for adjustment of the data in order to monitor trends. Tables 1, 2, 8, and 9 summarize cases and prevalence of HIV/AIDS. For the analyses of AIDS cases, we used data from the 50 states, the District of Columbia, and U.S. dependent areas.

Tabulation of Persons Living with HIV/AIDS, HIV Infection (Not AIDS), and AIDS

Tabulations of persons living with HIV/AIDS, HIV infection (not AIDS), or with AIDS (Tables 8–12 and Maps 1 and 2) do not reflect actual counts of cases reported to the surveillance system. Rather, the estimates are based on numbers of reported cases, which have been adjusted for delays in the reporting of cases and deaths.

Tabulation of Deaths of Persons with AIDS

Tabulations of deaths of persons with AIDS (Table 7) do not reflect actual counts of deaths reported to the surveillance system. Rather, the estimates are based on numbers of reported deaths, which have been adjusted for delays in reporting.

Geographic Designations

Regions of residence included in the report are defined as follows.

Northeast: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont

Midwest: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin

South: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia

West: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming

U.S. dependent areas: American Samoa, Guam, the Northern Mariana Islands, Puerto Rico, and the U.S. Virgin Islands

Metropolitan Statistical Areas

In the *Federal Register* for December 27, 2000, the OMB published revised standards for defining metropolitan statistical areas (MSAs) for use in federal statistical activities [17]. These standards, which provided for the identification of MSAs in the United States and Puerto Rico, replaced the 1990 standards. The adoption of the new standards was effective as of December 27, 2000. On June 6, 2003, the OMB announced new MSA definitions based on the new standards and Census 2000 data [18]. Table 15 presents reported AIDS cases, by MSA, for areas with populations of more than 500,000. The MSAs listed in Table 15 are defined according to the OMB's most recent update (February 2005) of statistical areas [19].

Survival Analyses

For the survival analyses presented in Section 4 (Table 13 and Figures 2–4), we used the Kaplan-Meier method to estimate the probability of survival for AIDS case data reported through June 30, 2007. Table 13 was limited to AIDS cases diagnosed in 2002, and Figures 2–4 were limited to cases diagnosed during 1998–2005. Table 13 and the figures were limited to deaths through December 31, 2006; this was done to allow at least 6 months for a death to be reported by June 30, 2007, and to allow at least 1 month after AIDS diagnosis.

Transmission Categories

Transmission category is the term for the classification of cases that summarizes a person's possible HIV risk factors; the summary classification results from selecting, from the presumed hierarchical order of probability, the 1 risk factor most likely to have been responsible for transmission. For surveillance purposes, cases of HIV/AIDS, HIV infection (not AIDS), and AIDS are counted only once in the hierarchy of transmission categories. Persons with more than 1 reported risk factor for HIV infection are classified in the transmission category listed first in the hierarchy. The exception is men who report sexual contact with other men and injection drug use; this group makes up a separate transmission category.

Persons whose transmission category is classified as male-to-male sexual contact include men who report sexual contact with other men (i.e., homosexual contact) and men who report sexual contact with both men and women (i.e., bisexual contact). Persons whose transmission category is classified as high-risk heterosexual contact are persons who report specific heterosexual contact with a person known to have, or to be at high risk for, HIV infection (e.g., an injection drug user).

Adults and adolescents born in, or who had sex with someone born in, a country where heterosexual transmission was believed to be the predominant mode of HIV transmission (formerly classified as Pattern II countries by the World Health Organization) are no longer classified as having heterosexually acquired HIV infection unless they meet the criteria stated in the preceding paragraph. Similar to other cases in persons who were reported without information about a behavioral or a transfusion risk factor for HIV infection, these cases are classified (in the absence of other risk factor information that would classify them in another transmission category) as "no risk factor reported or identified" [20]. Cases in children whose mother was born in, or whose mother had sex with someone born in, Pattern II countries are now classified (in the absence of other risk factor information that would classify them in another transmission category) as "mother with documented HIV infection, a risk factor for HIV infection, or HIV infection without a specified risk factor."

Cases in persons with no reported exposure to HIV through any of the routes listed in the hierarchy of transmission categories are classified as "no risk factor reported or identified." No identified risk factor (NIR) cases include cases that have been followed up by local health department officials; cases in persons whose exposure history is missing because they died, declined to be interviewed, or were lost to follow-up; and cases in persons who were interviewed or for whom other follow-up information was available but for whom no mode of exposure was identified.

As of September 2000, the procedures for investigating cases reported without risk factor information changed from ascertaining a risk factor for all reported cases to estimating risk factor distributions from statistical models and population-based samples. States continue to investigate any report of an unusual exposure to HIV and report these cases to CDC. CDC will continue to tabulate the number of documented unusual exposures to HIV reported by the states.

Because recently reported cases of HIV infection or AIDS are more likely to be reported without sufficient risk factor information, recent AIDS incidence in some transmission categories will be underestimated unless an adjustment is made. For tables and figures showing the estimated cases of HIV infection (not AIDS), HIV/AIDS, and AIDS, the adjustment of cases among adults and adolescents without risk factor information is based on the redistribution of transmission category, by specific sex, race, and region, of cases that were diagnosed 3 to 10 years earlier and initially classified as NIR but that were later reclassified [21, 22]. Similar adjustments of such cases among children are based on transmission-category redistribution of all cases diagnosed during that period and later reclassified.

Reporting Delays

Reporting delays (time between diagnosis of HIV infection or AIDS and report to CDC) may differ among exposure, geographic, racial/ethnic, age, sex, and vital status categories; for some AIDS cases, delays have been as long as several years. Adjustments of the estimated data on HIV infection (not AIDS) and on AIDS to account for reporting delays are calculated by a maximum likelihood statistical procedure. This procedure takes into account the differences in reporting delays in exposure, geographic, racial/ethnic, age, sex, and vital status categories and is based on the assumption that reporting delays in these categories have not changed over time [14, 15, 23].

Rates

Rates per 100,000 population were calculated for the numbers of HIV/AIDS or AIDS cases (Tables 5a, 5b, 14, and 15) in 2006, as well as for persons living with HIV infection (not AIDS) or AIDS (Maps 1 and 2) at the end of 2006. The population denominators used to compute these rates for the 50 states and the District of Columbia were based on official postcensus estimates for 2006 from the U.S. Census Bureau [24] and bridged-race estimates for 2006 obtained from the National Center for Health Statistics [25]. The bridged estimates are based on the Census 2000 counts and produced under a collaborative agreement with the U.S Census Bureau. These estimates result from bridging the 31 race categories used in Census 2000, as

specified in the 1997 OMB standards [16] for the classification of data on race and ethnicity, to the 4 race categories specified in the 1977 standards. The population denominators for U.S. dependent areas were based on official postcensus estimates and Census 2000 counts from the U.S. Census Bureau's International Database. Each rate is calculated by dividing the number of cases reported during the 12 months in 2006 (or the number of persons living with HIV infection or with AIDS at the end of 2006) by the 2006 population, multiplied by 100,000. The denominators used for calculating age-, sex-, and race/ethnicity-specific rates are computed by applying the age, sex, and race/ethnicity proportions from the bridged-race population estimates for 2000 to the 2006 postcensus estimates of the total population for each state. When bridged-race population denominators for the U.S. dependent areas were not available, proportions from the U.S. Census Bureau's International Database for 2000 were used to estimate the age- and sex-specific subpopulations [26].

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